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Lithopone and Its Part in Paint

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Lithopone and Its Part In Paint

By L. H. TROTT

The New Jersey Zinc Company

I HAVE been asked to speak to you on the subject of Lithopone. It is an appropriate time to make this pigment the subject of a talk to you master painters, for Lithopone has made possible some of the products you handle in largest quantities in your daily work, and, whether you realize it or not, it has revolutionized the paint-making industry.

Lithopone is a paint pigment. By many people, a pigment is thought to be nothing more than coloring matter. Actually, a pigment is any insoluble matter added to the vehicle (either an oil, turpentine, liquid drier, clear varnish, a mixture of these or a clear lacquer) to give the paint color or opacity. There are dark pigments which are used to produce colored paints, and white pigments which are used for white paints and as the base for light tinted paints. Lithopone is a white pigment and gives to paint many desirable qualities which I shall describe later on in this talk.

Lithopone has undergone many changes since first produced in this country in 1906. These improvements and their significance I shall point out as I think you should know Lithopone, since it has a great bearing on your materials, your jobs and your profits. I shall try to explain it more by means of showing you some exhibits than by depending on words alone.

First, I want to speak briefly about its manufacture. On this table you will see the raw materials: barytes, as mined, coal, zinc oxide and sulphuric acid. The first operation is to crush the barytes and the coal and roast them together. This yields a black mass called "black-ash" and from it the so-called "barium liquor", containing barium sulphide in solution, is obtained by leaching with water. In another vat, the zinc oxide is dissolved in sulphuric acid. These two solutions are rid of objectionable impurities and run together, this operation forming the crude Lithopone. I have two solutions prepared here—one, the barium sulphide, the other, the zinc sulphate, and will pour them together. You will see the white, insoluble crude Lithopone separate out.

This crude Lithopone is not suitable for use in paint, and in order to make it so it must be processed. It is this processing which may either make or

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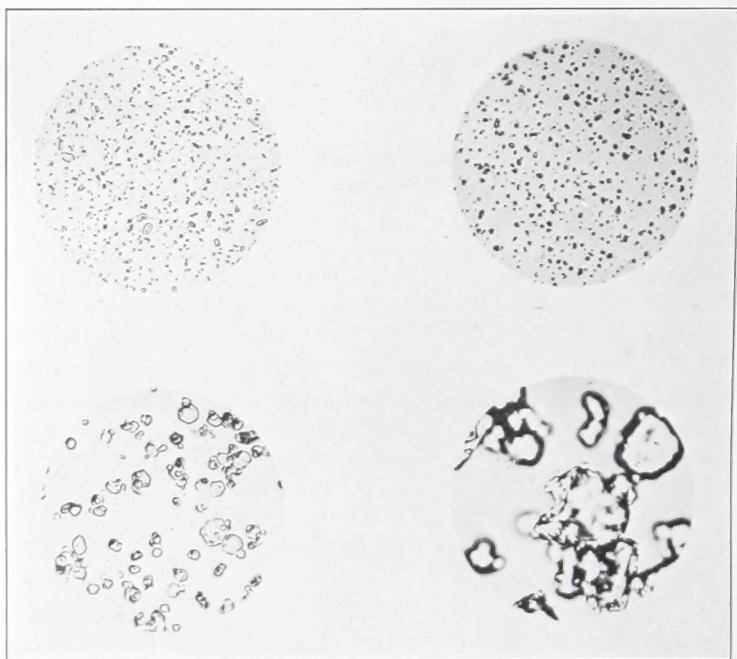


FIGURE 1.

Photomicrographs of White Pigments

Left, Above—Zinc Oxide

Right, Above—Lithopone

Left, Below—Basic Carbonate
White Lead

Right, Below—Inert Pigment

break the product. The first step is to wash the crude Lithopone with water, filter and dry it, then heat it red-hot in a muffle without letting air get at it. It is next quenched by dumping the hot mass into cold water. Then it is ground wet, dried, ground again dry, and packed in bags or barrels. Here is some of the finished product. And what is it? It is a compound of 30% zinc sulphide and 70% barium sulphate which is made to precipitate in such a way that the pigment after muffling is soft, and can easily be ground so finely that the maximum strength of the Zinc Sulphide—one of the strongest white pigments known—is developed and uniformly distributed over the entire mass.

Now that we have some finished Lithopone, let us see what it is like. First, it is non-poisonous, and if you care to taste some as I am doing, you need not be afraid of the results. I can assure you that it has been thoroughly sterilized, machine packed, and in all probability has not been touched by human hands. However, it is better used in paint than as an article of diet, and neither you nor I would care about eating a pound of it any more than we would want to eat a pound of sand.

Lithopone is one of the finest white pigments known, and because of some improved methods of handling the microscope and the camera, I can show you how these particles actually look and how they compare in size with other white pigments. These photographs (Figure I) tell the story, and in order that you may see better, from where you are, the relative size of the different pigments, I have represented them on this enlarged chart (Figure II). The space represents the size of a hole in the finest screen made, and in this space is shown the average size of single particles of zinc oxide, Lithopone, basic carbonate white lead and a typical inert pigment.

Next, let us see what will happen when Lithopone is rubbed up with linseed oil and thereby comes a step nearer to what you are most interested in—paint. I shall rub some out and spread it on glass. At the same time I shall make a rub-out of basic carbonate white lead and will place it on the same slide. You can readily see the better color of the Lithopone paste.

In order to save time I have had made two rub-outs in linseed oil, using in each case the same weight of ultramarine blue and the same weight of white pigments, the white pigments being this same Lithopone and white lead. Placed side by side, these rub-outs show a different color, the Lithopone being lighter. This indicates the comparative strength of the two pigments, the stronger one, Lithopone, being less blued by the ultramarine. It is the test usually made for grading the strength of white pigments. The same results are obtained if lamp black is used instead of blue (Figure III).

Likewise two other slides have been prepared, each containing a rub-out of Lithopone and basic carbonate white lead. Both slides have been subjected to gases that are found in town and city smoke—one slide to hydrogen sulphide gas and the other to sulphur dioxide. You can readily see the manner in which the Lithopone has resisted turning off color in contrast with the blackening of the lead (Fig. IV).

The qualities in Lithopone that have been discussed so far—strength, fineness, intense whiteness, and resistance to sulphur fumes—were all points

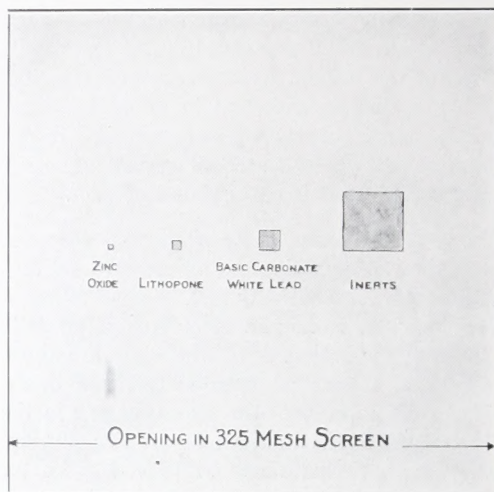


FIGURE II.

Comparative Particle Sizes of White Pigments and 325 Mesh Screen Opening.

that led the paint manufacturer to try out the pigment in interior paints. He was further encouraged when he found Lithopone could be safely mixed with any other paint pigment—white or colored; that it was easy to incorporate in most of his vehicles; and that it made a paint which would keep and work well. Just as important to him was the price, and he found this within reason. This combination—quality, workability, cost—resulted in his now making practically all his flat whites, gloss whites, light tints, and a host of industrial specialties with Lithopone as the chief pigment. It is these flat and gloss whites and light tints you are spreading today on interior walls, and every time you paint the walls and ceilings of a 12-foot room with two coats of flat white, you leave about 30 pounds of Lithopone behind. The best enamels, however, are still made with pure zinc oxide.

Lithopone was limited to interior paints for a long time, for in the beginning it had a very bad habit. You know what it was. It turned gray and nearly black in the sunlight. *Why*, is still being discussed. What was more important than to know *why* was to know *how* to overcome it. It was in 1920 that a Lithopone manufacturer found out, and by refining the process startled the whole paint world by making Lithopone that told "Old Sol"—"You can shine and shine and I will not get black in the face."

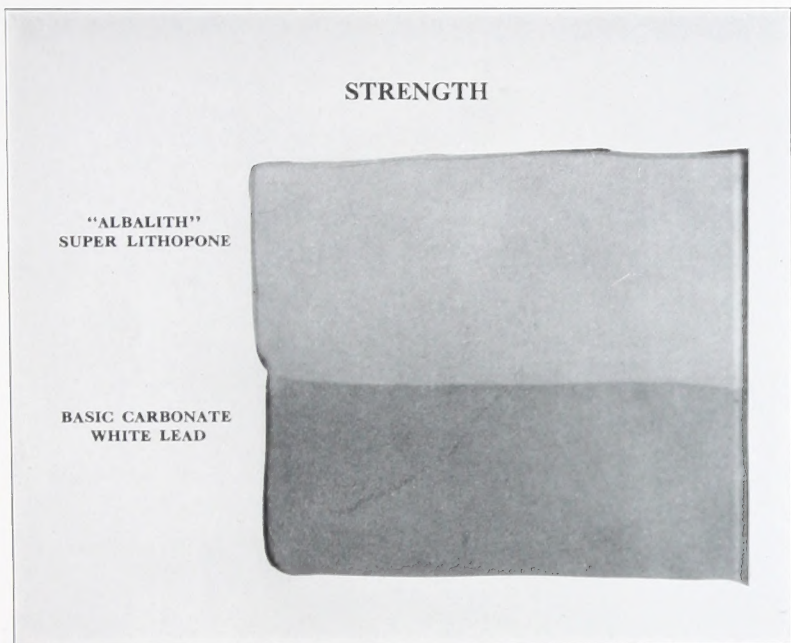


FIGURE III.

I have exposed some of the old-time Lithopone beside some present-day light-resistant Lithopone before a lamp that gives out what is really concentrated sunlight. That is to say, it is rich in those rays—the ultra-violet rays—that turn lithopone dark if it has any tendency in that direction. You can see what has happened (Fig. V). The new light-resistant Lithopone has remained perfectly white and the other has turned black. It “developed” much like a photograph. The same effect can be produced by sunshine.

What was the significance of this improvement? It meant that here was another white pigment that had possibilities of use in outside paints. You will remember that at that time—six years ago—there were only two outside white paint pigments used,—zinc oxide and white lead. In the pursuit of developing an outside paint from Lithopone it was soon found that when used straight in linseed oil the paint dried with too soft a film. It was then

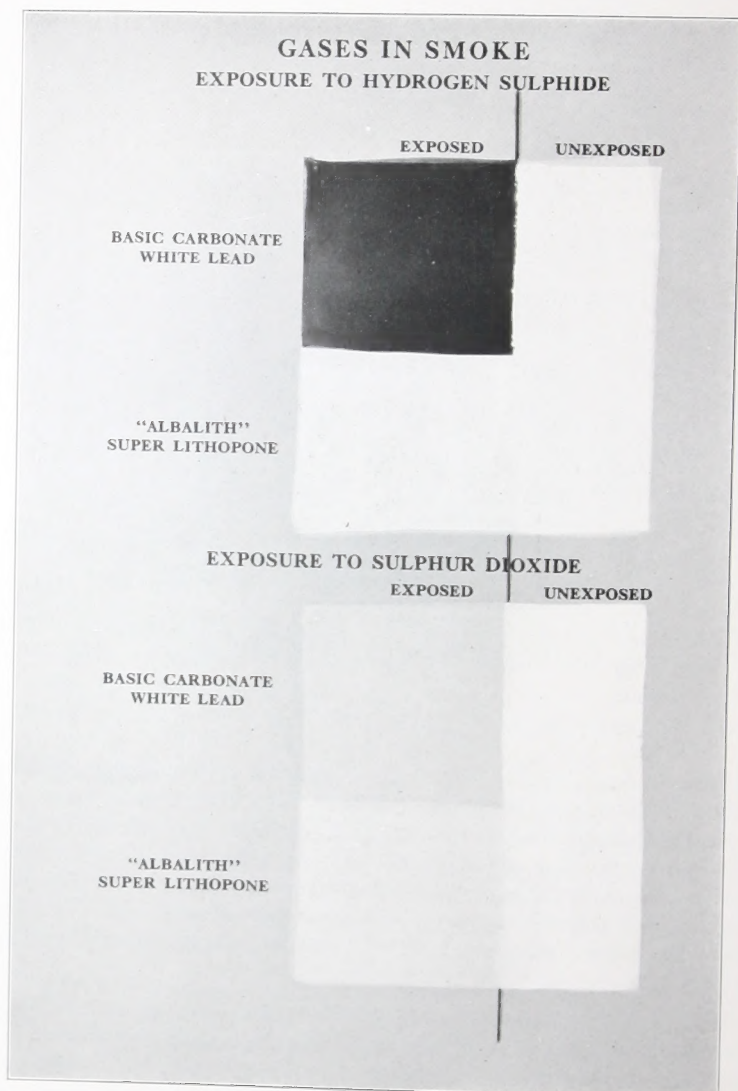


FIGURE IV.

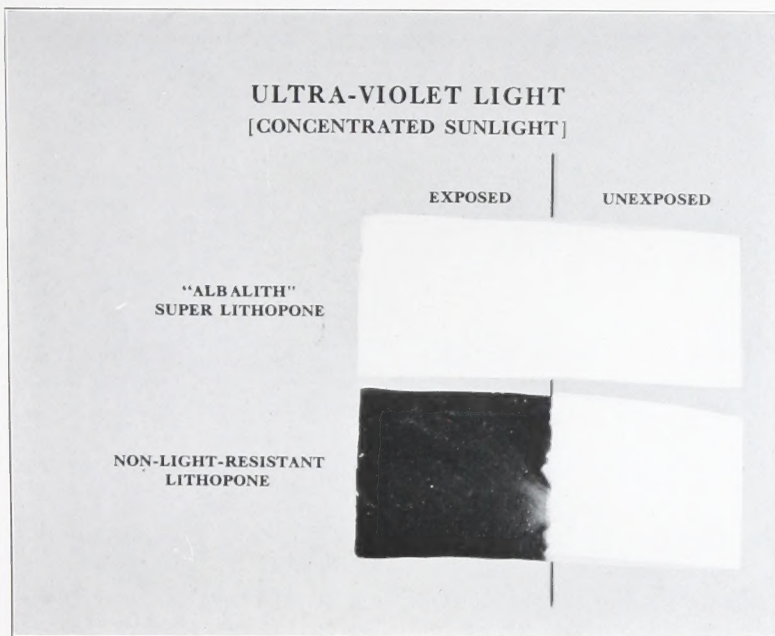


FIGURE V.

necessary to call in the assistance of a white pigment that dried naturally to a hard film. Zinc oxide was pressed into service and the combination greatly improved the paint. But Lithopone and zinc oxide, as I showed you in the beginning, are very fine pigments and they required the addition of a coarser pigment. So the inert pigments—silica, magnesium silicate, or barytes, were added to the formula, and it was found that about 20% of the inert in combination developed a paint which actually wore and weathered better, and this amount is now usually included.

Such a paint—Lithopone—Zinc Oxide—inert pigment paint—carries about 60% of pigment and 40% of vehicle when ready to spread, and weighs about $14\frac{1}{2}$ pounds per gallon. It has been stated that an outside white house paint should carry more nearly 70% of pigment than 60, and only 30% of vehicle instead of 40. It is contended that any white pigment can properly take care of and protect only a certain amount of linseed oil, and any more than this amount weakens the paint film. With the latter

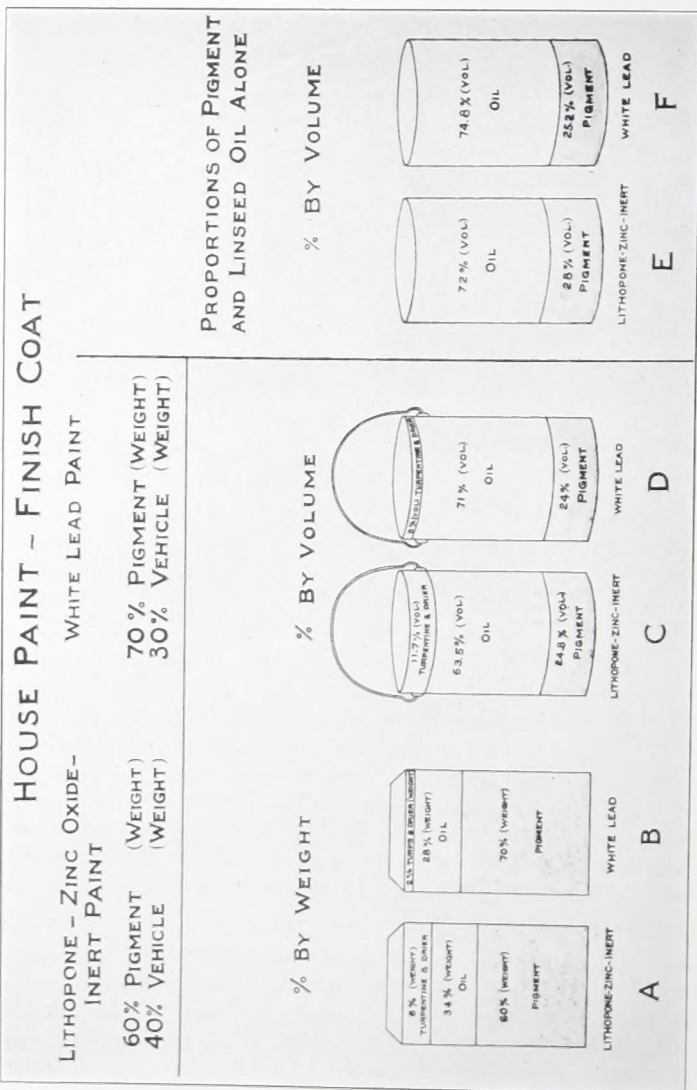


FIGURE VI.
Comparison of Percentage by Weight and Percentage by Volume of Pigment and Vehicle in
White House Paint Ready to Spread.

contention I am in full accord, but if Lithopone, Zinc Oxide, and inert pigments constitute the pigment portion of a paint only 60% is necessary for this reason:

Everyone knows that a clear oil will not wear as long out-doors as an oil that carries pigment. Oil is both porous and perishable and must be completely protected from the weather. The pigment gives this protection by acting largely in two capacities:

1. As a sunshade.
2. As a series of little plugs.

Taking up the first consideration, a gallon of paint spread on a house and allowed to dry covers a certain area. This is measured in square feet or square yards. A portion of this area is occupied by the oil and a portion by the pigment. It makes no difference whether there were 70 pounds or 60 pounds of pigment spread for every hundred pounds of paint, but the thing that matters is whether or not the pigment occupies enough of the space to completely shade or protect the oil spread with it.

In the second consideration it must be remembered that oil alone forms a porous film, and if magnified might be imagined to look like a fine screen. There must be a sufficient number of pigment particles present to plug up all these openings or pores. Now, if you have a bottle cork, you purchase a cork of a certain size, perhaps one that is $\frac{7}{8}$ of an inch in diameter. You do not go to the store and ask for a 16th-ounce cork or a cork of any other weight. You are interested primarily in size, space, area, volume, and do not care a thing about weight. Lead, as you know, is extremely heavy, which means nothing more than that a certain weight occupies relatively little space. Therefore, where you are using a lighter pigment, you require less pounds to occupy the same or greater space. Thus, in the paint in the can or on the job, you are interested in the VOLUME of the pigment and the VOLUME of the vehicle or oil, and it must be this PERCENTAGE BY VOLUME that is the accurate gauge of what you need. ✓

This chart tells the story (Figure VI). The objects to the left of the vertical line represent cans of third or finish-coat paints that are ready to apply—the one, a Lithopone—Zinc Oxide—inert pigment paint containing 60% by weight of pigment and 40% by weight of vehicle, and the other, a straight lead paint containing 70% by weight of pigment and 30% by weight of vehicle. The two cans marked A and B show the amount of pigment and vehicle compared on a weight basis. By converting the relationship to a volume basis, that is to say, gallons of pigment to gallons of

vehicle, we find that they appear as shown in the middle two cans marked C and D on the chart, the Lithopone—Zinc Oxide—inert pigment paint showing 24.5% pigment by volume and 75.5% vehicle and the lead 24% pigment by volume and 76% of vehicle. Thus, there is practically no difference between the two paints when looked at in this way, and you can see that the Lithopone base paint carries sufficient pigment to take care of the oil.

At the right marked E and F, I have shown the volume proportion of the pigment to the oil alone, which more nearly represents what actually remains on the house, since the turpentine and most of the liquid drier disappear into the air. Here the Lithopone-Zinc-Oxide-inert pigment paint shows 28% pigment by volume and the lead paint 25.2% by volume.

The big question you all have in your mind is, "What will this Lithopone base paint do?" The immediate effect that you observe on applying it is indicated on this first panel, which shows how much whiter three coats of Lithopone base paint are, and how much better it covers than three coats of white lead. Being whiter, it yields clearer tints, as is shown on these succeeding pairs of panels. That it will wear and stay white, you can see by the next pair of panels which have been exposed for two years facing south. Also in tints, their excellent wearing and color retaining qualities will be seen by the last pair of panels. But the best proof is the fact that thousands of houses have been painted with this type of paint (some of these by yourselves), and have given entire satisfaction.

✓ This development—an outside white house paint made on a Lithopone base—is the direct result of the improvement in Lithopone which enabled it to hold its color in the bright sunlight.

So far in this talk I have made a number of statements. I consider all of them facts of a technical nature that you or anyone else can substantiate. What I am going to tell you in the next two minutes is a matter of record.

Lithopone, first made in this country in 1906, has increased in popularity so that after twenty years it is being produced in practically as large quantities as zinc oxide and white lead. In 1925 about 150,000 tons of each of these pigments was made. *Figure VII shows the production figures available (1925) at the time the paper was given. In this reissue of the pamphlet (January 1930) the chart has been revised to include the latest information (1928).*

By far the largest portion of the Lithopone used has gone into interior paints. It has now apparently become of age in its twenty-first year and able to go out of doors. That it is able to take care of itself in its new environment is manifested by an actual check-up which showed that well

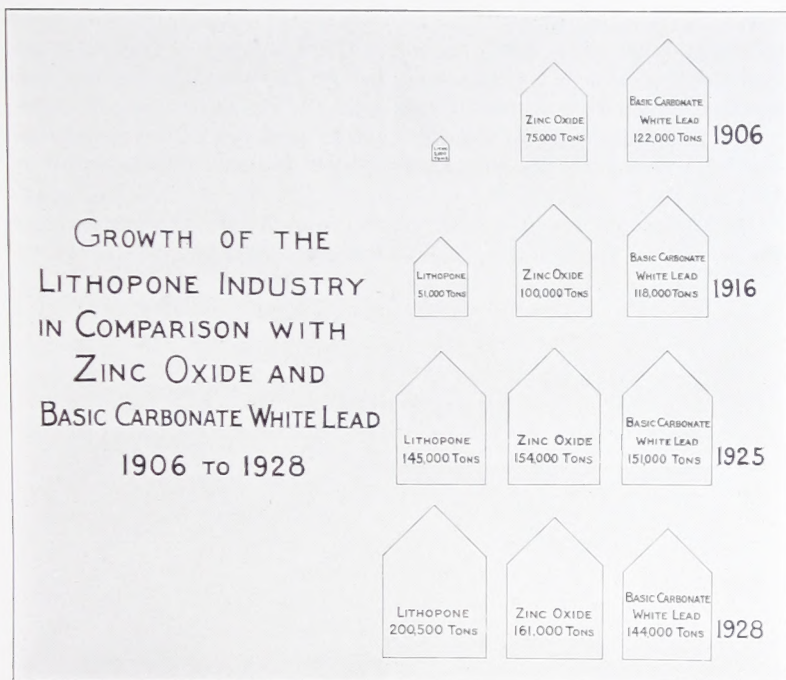


FIGURE VII.

Growth of Lithopone Industry in Comparison with Lead Free Zinc Oxide and Basic Carbonate White Lead. 1906-1928

over four-fifths of the paint manufacturers in the country are marketing an outside paint made on a Lithopone base. How many painters are using it, I don't know, but if it is being made it is certainly being used and you are the men who are using it.

This relatively recent out-of-door application of Lithopone means its still further growth and wider use by the trade. It not only interests the Lithopone manufacturer but the profits come right down to where you can enjoy your share, for if you use white paint indoors or out—YOU CAN BUY MORE SQUARE FEET OF HIDING POWER FOR A DOLLAR BY BUYING LITHOPONE BASE PAINT THAN YOU CAN BY BUYING A PAINT MADE FROM ANY OTHER WHITE PIGMENT KNOWN.

It is this economic aspect that I have attempted to lead up to throughout this talk. I have traced the individual characteristics of Lithopone and outlined their fitness for the various paints. Like anything else, the more familiar you are with the parts that contribute to its merits the better able you will be to make use of the whole and to capitalize on this knowledge. For this reason I feel that you should KNOW Lithopone in the same way that you know sugar, salt and the many other things that you daily apply to the needs of your work and your play in order to improve the profits you get out of your vocation and from the business of life.



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ALBALITH is a lithopone of proved excellence of quality. It possesses remarkable uniformity, light resistance, color, brightness and fineness of particle size. These outstanding qualities give beauty and durability to paint films containing proper proportions of Albalith.

Manufacturers of quality paints use Albalith extensively in interior paint of all sorts (gloss finishes, flat finishes, mill whites, under-coaters, etc.) and in exterior paint in conjunction with XX American Process Zinc Oxide.

